

A NEW SPECIES OF *PSILOGOBIUS* FROM THE  
INDO-PACIFIC WITH A REDESCRIPTION OF  
*PSILOGOBIUS MAINLANDI*  
(PISCES: GOBIIDAE)

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*Abstract.* — The genus *Psilogobius* Baldwin is redescribed and now contains two species, *P. mainlandi* from the Hawaiian Islands and *P. prolatus*, new species, from the Great Barrier Reef, Australia and the Cocos-Keeling Islands, eastern Indian Ocean. Pronounced sexual dimorphism occurs in both species. In addition to the genital papilla, males have longer fins, longer filamentous first dorsal fin spines, longer upper jaws than the females, and differ in coloration. *Psilogobius prolatus* differs from *P. mainlandi* in having dark pigmentation on the upper jaw, the AITO sensory pore usually present, a small patch of tiny scales on upper operculum, pectoral fin rays less numerous, modally 15, longer dorsal, anal and caudal fins, a longer upper jaw and in certain sexual dichromatic marks or bars.

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*Psilogobius mainlandi* was originally described by Baldwin (1972:125) as monotypic from specimens collected by G. B. Mainland in 1939 at Kaneohe Bay, Oahu, Hawaiian Islands. Mainland named the new species *Paroxyurichthys edmondsoni* and described it in his master's thesis that was never published. The name *Paroxyurichthys edmondsoni* was published by C. H. Edmondson (1946); however, Baldwin (1972:125) noted that there was no description or illustration and that the name constituted a nomen nudum. The first author, while examining recently captured *Psilogobius* from Hawaii, thought he had a new species. Further study revealed that these specimens were *P. mainlandi* but were not easily recognized since many important diagnostic features were overlooked or vague in Baldwin's account. A redescription of *P. mainlandi* from the Hawaiian Islands revealed a new species of *Psilogobius* from Australia and the eastern Indian Ocean.

#### Methods

Methods follow those of Lachner and Karnella (1980), and Lachner and McKinney (1974, 1978), except where indicated. The pterygiophore formula of the spines of the dorsal fin in relationship with the underlying vertebrae is after Lachner and McKinney (1974:875). Measurements were made with dial callipers in mm, and counts were taken from the left side unless noted otherwise. Measurements of fins follow Hubbs and Lagler (1958:25) except for the caudal fin which is measured from the central hypural base to the posterior tip of the longest ray. All proportional measurements are expressed to the nearest tenth of a percent of the standard length (SL), except for certain tabular data. Osteological aspects of the study were accomplished with radiographs, and cleared and alizarin stained specimens.

In the descriptive accounts the values given for meristic characters are followed

by the frequency in parenthesis; the holotypic value is italicized. Data in the material examined section include the following: type status (if any), catalogue number, number of specimens, sex, SL in parenthesis (range if more than one specimen), specific locality, date collected, and collector.

Abbreviations and terminology used to designate cephalic sensory pores follow Lachner and McKinney (1974:865): NA, nasal; AITO, anterior interorbital; PITO, posterior interorbital; AOT, anterior otic; SOT, supraotic; IT, intertemporal; POP, preopercular.

The following abbreviations are used to designate institutions and collections cited: AMS, Australian Museum, Sydney; ANSP, Academy of Natural Sciences, Philadelphia; BPBM, Bernice P. Bishop Museum, Honolulu; NTMA, Northern Territory Museum, Darwin, Australia; USNM, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

*Psilogobius* Baldwin

Fig. 1

*Psilogobius* Baldwin, 1972:125 (type-species: *Psilogobius mainlandi* Baldwin, 1972:126 by original designation).

A small, tropical, marine, Indo-Pacific goby, body elongate, subcylindrical and somewhat compressed; branchiostegals 5; 6 spines in first dorsal fin; first dorsal fin free from second dorsal fin; pterygiophores 3 (22110); vertebrate (including urostyle) 10 + 16 = 26; gillrakers on outer arch 3 + 1 + 7 or 8. Ctenoid scales well developed on caudal peduncle, becoming progressively smaller anteriorly; ctenii in a single row, well developed, spike-like, and equal or subequal on each scale (regenerated scales may lack ctenii); a patch of tiny scales sometimes present on upper portion of operculum; nape, breast and belly naked. Teeth conical, recurved; upper jaw teeth in 4 or 5 rows anteriorly, and 2 rows laterally; lower jaw teeth in 3 or 4 rows anteriorly, and 2 rows laterally; teeth absent on vomer and palatines. Cephalic sensory pore system is limited to anterior oculoscapular canal, pores NA, PITO, and AOT always present. Gill opening moderate. Sexual dimorphism present in coloration and morphology.

*Psilogobius mainlandi* Baldwin

Fig. 2

*Psilogobius mainlandi* Baldwin, 1972:126 (type-locality: Coconut Island, Kaneohe Bay, Oahu, Hawaiian Islands).

*Material examined.*—59 specimens, 32 males, 20 females and 7 juveniles or unsexed; size range 8.5–37.5 mm SL, largest male 37.5, largest female 34.3, smallest gravid female 22.6.

*Holotype.*—USNM 206174, male (30.9), Coconut Island, Kaneohe Bay, Oahu, Hawaiian Islands, 9 May 1968, W. Baldwin and J. Richards.

*Paratypes.*—BPBM 10862, female (34.3), Coconut Island, Kaneohe Bay, Oahu, Hawaiian Islands, 1 Apr 1968, J. E. Randall et al.; BPBM 10864, 26 (22.4–35.5), 17 males, 9 females (5 males cleared and alizarin stained), Kahaluu, Kaneohe Bay, Oahu, Hawaiian Islands, 7 Dec 1967, W. Baldwin et al.; BPBM 10865, 5 (10.0–20.3), 1 male, 2 females, 2 juveniles, Coconut Island, Kaneohe Bay, Oahu, Hawaiian Islands, 12 Jul 1968, W. Baldwin et al.; BPBM 22624, 4 unsexed (8.5–

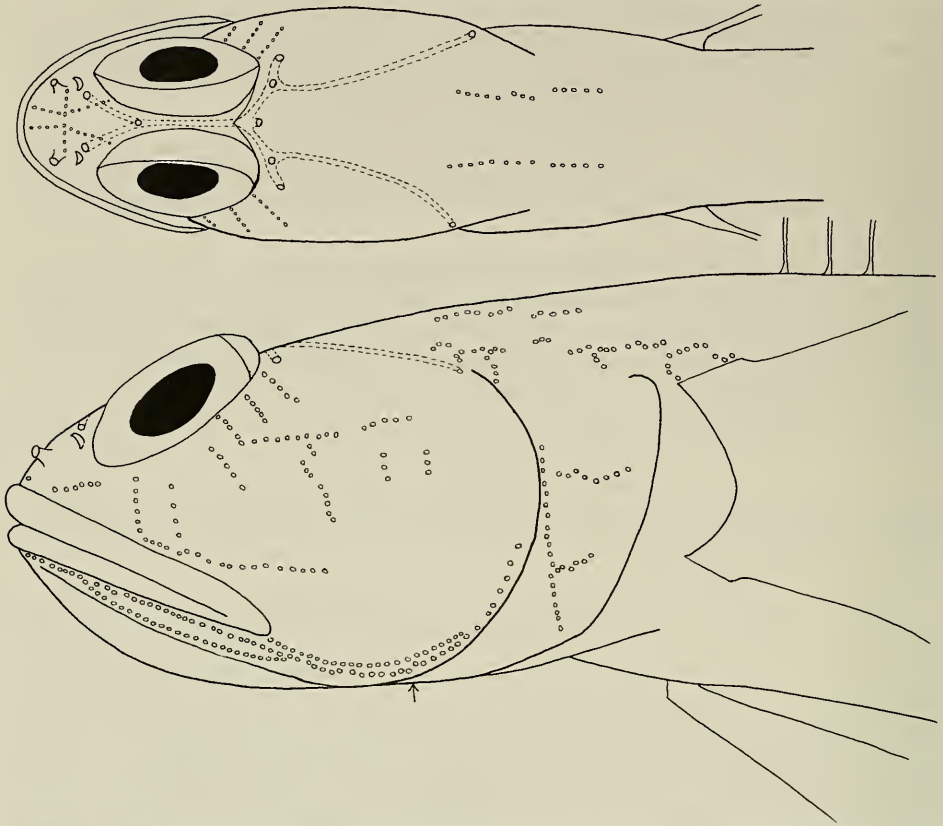


Fig. 1. Diagrammatic illustration of *Psilogobius* showing cephalic sensory pore system and cutaneous sensory papillae distribution on head. The arrow indicates the connection of the gill membrane with the isthmus.

23.5), Kaneohe Bay, Oahu, Hawaiian Islands, 13 May 1939, G. B. Mainland; USNM 206175, 21 (19.3–31.3), 12 males, 8 females, 1 unsexed, same collection data as holotype; USNM 202527, 1 male (37.5), same collection data as BPBM 22624.

*Diagnosis.* —Cephalic sensory pore AITO usually absent; pectoral fin rays normally 17; dorsal, anal and caudal fins and length of upper jaw shorter than in *Psilogobius prolatus*; patch of tiny scales on upper operculum absent; no dark pigmentation on upper jaw; males lack narrow, vertical silvery trunk bars; females have dark oblique band extending from notch between dorsal fins downward to anal aperture; silvery vertical trunk bars on females somewhat narrower than those on *P. prolatus*.

*Description.* —Dorsal rays VI-9 (1); VI-I,10 (55); VI-I,11 (1); anal rays I,8 (1); I,9 (54), I,10 (2); pectoral rays 15 (1), 16 (20), 17 (27), 18 (2), 19 (1),; counts for 1 specimen taken from right side due to deformed left pectoral fin; pelvic rays I,5 (57); segmented caudal rays 11 (1), 15 (4), 16 (13), 17 (34), 18 (2), 19 (1). First dorsal fin higher than second dorsal; first dorsal spines filamentous, second, third and fourth spines longest; third spine may reach base of tenth ray of second dorsal fin in mature males; origin of second dorsal fin over anus. Depressed

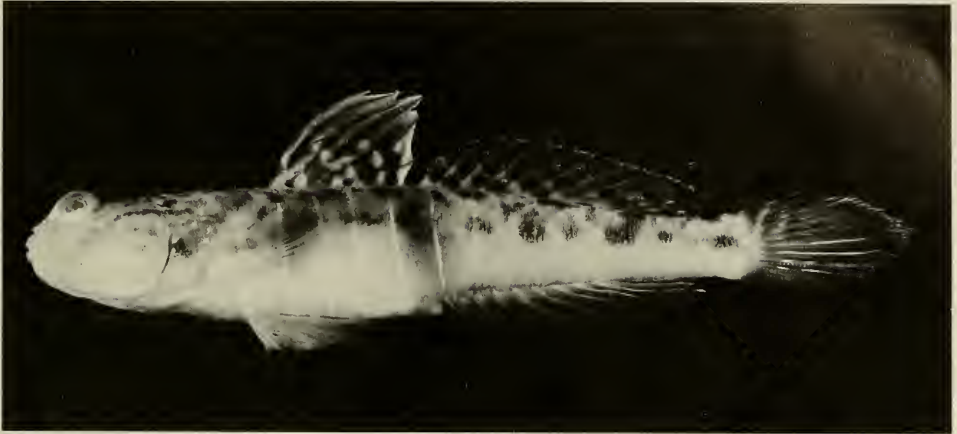


Fig. 2. *Psilogobius mainlandi*, paratype, 34.3 mm SL, female, Hawaiian Islands, BPBM 10862.

pectoral fin reaches to or beyond anus, posterior margin more or less rounded. Pelvic fins joined to form a cup-like oblong disk not adherent to body; pelvic fin frenum well developed between pelvic spines; pelvic fin rays branched with tips free; membrane between fifth medialmost rays complete along length of fin. Caudal fin oblong, equal to or shorter than head.

All scales ctenoid, extending from trunk to slightly onto caudal fin base; scales small, largest in area of hypural base; scales smallest in area of pectoral fin base. Ctenii on scales of hypural base range from 4 to 9 per scale with 8 or 9 radii; scales on midline of trunk between second dorsal and anal origin with 3 or 4 ctenii and 4 to 7 radii; scales in area of pectoral fin base with 1 to 3 ctenii and 3 to 4 radii. Scales in horizontal series highly variable, 32 to 78; their size and spacing vary considerably.

Head subcylindrical and somewhat compressed; bony interorbital very narrow with eyes nearly touching; snout short, less than diameter of eye; isthmus narrow, extending ventrally to base of pectoral fin. Mouth terminal, lower jaw not protruding and slightly oblique; upper jaw reaches posterior margin of eye in females and juveniles; well beyond posterior margin of eye in large males.

Cutaneous sensory papillae pattern poorly to moderately developed on head. Two or three transverse rows, and 1 or 2 longitudinal rows on cheek (see Fig. 1). No sensory ridges or barbels. Cephalic sensory pore system variable; AITO pore seldom present; IT pore often present (see Table 3).

Sexual dimorphic characters well developed. Male genital papilla tube-like, tapering and pointed at tip, about 4 times length of its base. Female genital papilla short, bulbous; about as long as length of its base. All fins of adult males longer than in females. Filamentous spines of first dorsal fin and upper jaw longer in males than females. Dimorphic differences not always obvious in small males.

*Color of preserved specimens.* — Trunk with 8 or 9 dark lateral spots that originate behind pectoral base and extend to hypural base. Spots tend to alternate in size with smallest at or near hypural base. Six to 8 dark spots dorsally on trunk extending from first dorsal fin to end of caudal peduncle. Trunk in females with 6 or 7 silvery, vertical, narrow bars separated by faint dusky areas; silvery bars

not meeting ventrally, and usually not extending to dorsal fins; bars absent in males. Females with dusky band between origin of second dorsal fin and anus. Branchiostegal membrane of males always dark; immature males show this characteristic before other external sexual characteristics develop; females lack branchiostegal membrane pigmentation.

First dorsal fin with light spots and dark patches; second dorsal fin with dark spots arranged in oblique rows. Posterior tips of pectoral and pelvic fins, lower third of anal and caudal fins dusky; markings more intense on males. Peritoneum silvery.

*Color in life.* — Following description from color slide of a 34.3 mm SL female specimen (BPBM 10862). Overall body color light brown; arched band from near end of upper jaw to above opercle; 7 small blue-white spots on lower preopercle; 4 patches of melanophores on cheek; lower  $\frac{2}{3}$  of opercle orange, 7 small blue-white spots near preopercular margin, 8 small blue-white spots near posterior margin of opercle; patch of melanophores in center of opercle; dusky patch at upper pectoral base and one above anus, a small dark spot between these; 5 prominent, narrow, vertical white bands extending from behind pectoral base posteriorly to origins of first dorsal and anal fins. Weak, narrow white band originates above second anal ray and extends almost to second dorsal fin base; 7 dark spots with orange tinge in center, originating at weak white band on mid-trunk and extending to caudal fin base; spots alternate in size. Dorsal surfaces of body and upper trunk with scattered dark spots extending from just below first dorsal fin to upper caudal fin base; 2 or 3 blue-white spots found between these dorsolateral spots; lower half of first dorsal fin with oblique bands that alternate from brown to blue-white, upper half of fin brown; lower  $\frac{2}{3}$  of second dorsal fin with oblique alternating brown and blue-white bands (similar to first dorsal fin); upper half of fin brown, its outer margin blue; upper third of caudal fin with weak alternating brown and blue-white bands, lower portion translucent; pelvic spines whitish, rest of fin orange with scattered melanophores, posterior tip dark; anal fin clear next to body progressively darkening distally.

*Ecology.* — Specimens examined were reported from marine habitats up to depths of 15 meters, over sand and silt in shallow water, in sandy areas around living reef. This species may require waters of sheltered areas that are little affected by wave activity.

*Psilogobius mainlandi* is found in association with an alphaeid shrimp; this association has been reported in *Cryptocentrus*-like gobies of the genera *Amblyeleotris*, *Cryptocentroides*, *Cryptocentrus*, *Ctenogobiops*, *Eilatia*, *Flabelligobius*, *Mahidolia*, *Stonogobiops*, *Tomiyamichthys*, *Vanderhorstia*, and *Yongeichthys* (Hoese and Randall 1982; Hoese and Steene 1978; Klauswitz 1974; Polunin and Lubbock 1977; Yanagisawa 1978). This relationship may exist in *Myersina* as well (Akihito and Meguro 1983).

*Remarks.* — Baldwin (1972) overlooked important characters and briefly treated others. He noted taking scale counts in his methods section, but none were given. The illustrations (1972, Fig. 1) of scales show ctenii to be wedge shaped, whereas they are actually spike-like. He stated that the scales are embedded, but we found the scales to be firmly attached anteriorly, while they may fall out posteriorly. Baldwin gave a vertebral count of  $10 + 15 = 25$ , but did not say if this includes the urostyle. Our examination of radiographs and cleared and stained specimens



Fig. 3. *Psilogobius prolatus*, paratype, 31.0 mm SL, female, Cocos-Keeling Islands, ANSP 131147.

shows the count to be  $10 + 16 = 26$ , including the urostyle. Baldwin (1972:126, Figs. 3, 4) described and showed the POP pores as present on the preopercle margin, but an examination of 72 specimens of both species showed the POP pores and the associated canal to be lacking. He stated that the third and fourth spines of the first dorsal fin are longest, but we find the second and third spines of the first dorsal fin are longest as confirmed by Baldwin's illustration (1972, Fig. 4). He described the branchiostegal membrane as dusky to dark; our examination shows this to be a sexual dichromatic feature and that the membranes are unpigmented in females. He mentioned the abdominal bars and noted that they are occasionally absent, whereas the bars are absent in all males in preservation.

*Psilogobius prolatus*, new species

Fig. 3

*Material examined.*—13 specimens totalling 8 males and 5 females; size range 27.5–36.1; largest male 36.1; largest female 35.0; no gravid material.

*Holotype.*—AMS I.20578-002, 1 male (34.2), patch reef, One Tree Island, Capricorn Group, Great Barrier Reef, Queensland, Australia, western Pacific Ocean, 23°30'S, 152°05'E, 30 Nov 1973, B. C. Russell et al.

*Paratypes.*—AMS I.20578-007, 2 (33.2, 35.4), 1 male, 1 female, same collection data as holotype; ANSP 131145, 1 male (33.7), West Island, Cocos-Keeling Islands, eastern Indian Ocean, 12°9'00"S, 96°50'15"E, 15 Mar 1974, W. F. Smith-Vaniz et al.; ANSP 131147, 5 (29.6–36.1), 2 males, 3 females, West Island, Cocos-Keeling Islands, eastern Indian Ocean, 12°7'40"S, 96°51'35"E, 18 Mar 1974, W. F. Smith-Vaniz et al.; USNM 265099, 2 (32.8, 34.5), 1 male, 1 female, same

Table 1.—Meristic, morphometric and color differences between the two species of *Psilogobius*. Proportional values include number of specimens, range in parenthesis, followed by mean value.

Character	<i>P. mainlandi</i>	<i>P. prolatus</i>
Number of pectoral fin rays	modally 16–17	modally 15
Small scales on upper operculum	absent	present
AITO sensory pore	usually absent	usually present
Length of upper jaw in male	29 (12.5–17.3) 15.0	8 (16.0–18.5) 16.8
Length of upper jaw in female	20 (10.3–15.2) 13.5	5 (14.3–16.6) 15.1
Length of anal fin in male	13 (37.7–45.4) 42.1	8 (43.4–51.2) 47.0
Length of anal fin in female	9 (36.3–41.4) 39.6	5 (38.7–44.6) 42.4
Length of pectoral fin	22 (21.2–26.0) 23.4	13 (19.4–24.4) 21.6
Length of second dorsal fin	22 (40.3–47.5) 43.6	13 (42.8–49.9) 45.9
Length of caudal fin	22 (24.3–34.1) 29.6	13 (29.4–40.4) 34.2
Length of head	22 (29.3–33.1) 31.6	13 (28.2–32.4) 30.3
Upper jaw pigmentation	absent	posteriorly darkened; weak in female
Branchiostegal membrane	dark; male only	dusky; male only
Silvery trunk bars in male; in preservation	absent	5–6
Silvery trunk bars in female, in preservation	6–7	6–7
Dusky vertical bar from notch between dorsal fins downward to anal aperture	present; female only	absent

collection data as ANSP 131147; USNM 266378, 2 males (27.5, 34.3), same collection data as holotype.

*Diagnosis.* —Cephalic sensory pore AITO usually present; pectoral fin rays modally 15; dorsal, anal and caudal fins and length of upper jaw longer than in *P. mainlandi*; small patch of tiny scales on upper portion of operculum; some dark pigmentation on upper jaw; males with 5–6 narrow, vertical, silvery trunk bars; females lack dark oblique band on middle of trunk that extends from notch of dorsal fins to anal aperture; silvery vertical trunk bars on females wider than in *P. mainlandi*. Other differences between these two species are shown in Tables 1–5.

*Description.* —Dorsal rays VI–I, 10 (13); anal rays I, 9 (11), I, 10 (2); pectoral rays 14 (1), 15 (12); pelvic rays I, 5 (13); segmented caudal rays 15 (1), 16 (1), 17 (11). First dorsal fin higher than second dorsal fin; spines filamentous with third spine longest. Depressed pectoral fin reaching to or slightly short of anus, posterior margin rounded. Pelvic fins joined to form oblong cup-like disk not adherent to body; pelvic frenum well developed; pelvic fin rays branched with tips free; membrane between fifth (medialmost) rays of pelvic fins complete along entire length. Caudal fin oblong, equal to or slightly longer than head. See Tables 1, 2 and 5 for fin differences in *P. mainlandi* and *P. prolatus*.

Table 2.—Number of pectoral fin rays in species of *Psilogobius*.

Species	Pectoral fin rays						
	13	14	15	16	17	18	19
<i>P. mainlandi</i>			1	19	25	2	1
<i>P. prolatus</i>		1	12				